graphic records of all the elements. One occurred between 10.30 and 11.25 p.m. on the declination, the magnet swinging east, and the range being 38′. This was preceded at 11.5 p.m. by an increase of H.F. of 31′. A second peak was recorded on this element at 1.45 a.m. on June 18, the force decreasing by 11′. A small decrease of V.F. accompanied this movement of the H.F.

The sun's surface, though disturbed, had been almost free from spots between June 5–11. But from June 12, when a group of spots appeared in bright faculæ at the east limit, and almost on the sun's equator, the solar surface became very active with spots, bright faculæ, pores, and drifts of granulations. Individually the spots were not very large, but on June 17–18 there were no fewer than seven groups of spots visible, all displaying considerable changes of form. In particular there were two sympathetic groups, one, already referred to, extending in latitude from +1·5° to +4°, and in mean longitude 35°, and the other in latitude −17° and longitude 46°. The whole region of the sun between these two groups was very active, the faculæ being visible even at the centre of the disc, with streams of granulations connecting the two groups. On June 17 the southern group passed the central meridian, and the northern group on June 18. The heliographic latitude of this northern group was almost exactly that of the earth as projected on the sun, so that on June 18 the spot group and the earth were radially opposite one another. Such a close approximation of the position of the spot and the earth referred to the sun's central meridian during a magnetic storm is very unusual. It certainly has not occurred in any violent magnetic storm since the year 1898.

A. L. Cortie.

Stonyhurst College Observatory, June 20.

Man's True Thermal Environment.

Following Dr. Hill's article on healthy atmospheres in Nature of April 22, a letter appeared in Nature of May 6 under the above heading, which suggests that too narrow a view has been taken of this important subject. Dr. Milne writes from a place where man exists in spite of the climate, and no doubt the robustness of the local race is largely due to generations of selection under rigorous conditions that are only overcome with the aid of ponderous clothing and heated dwellings. At the outset we should inquire as to the thermal conditions that existed at the birth of our race. No doubt man soon learnt to keep himself warm by artificial means, but he appeared first in association with a fauna almost tropical in character. It is in tropical regions that our race exists to-day in comfort with little or no protection and in spite of many adverse organisms that are also favoured by warmth.

What results would Dr. Milne's psuchrainometer give us in these places? For it is of importance if figures of any value are to be obtained that the methods should be generally applicable to habitable regions. It is not remarkable that methods bred in an extreme climate must fail in quite congenial regions but where the air temperature is often over 38° C. and sometimes exceeds 45° C. Here, no doubt, Dr. Milne's ingenuity would produce a metapsuchrainometer to tell us what heat must be taken from a body to keep it at blood-heat. We should be the richer for a valuable device, but our knowledge of man's true environment would not be much advanced.

Meteorologists have succeeded very well in obscuring the significance of the wet-bulb temperatures by wrapping them up in terms of relative humidity. The relation of the dry- and wet-bulb reading, besides giving us the potential cooling power of the atmosphere as it affects a moist surface, enables us to arrive at the absolute humidity and the specific heat of the air. This last factor no doubt varies considerably with the moisture content, and must be of importance in the convection affecting the heated body of the psuchrainometer.

Dr. Milne's ψ only takes into account the air temperature, specific heat and velocity, provided radiation effects are constant. It cannot be taken to represent the whole environmental effect, which depends also on the power of the air to take up moisture. The katathermometer figures appear most promising in this respect, but the present form of instrument is probably not completely suitable for hot climates.

G. W. Grabham.

Khartoum, May 26.

A Continuous Spectrum in the Ultra-Violet.

The following observation may be of interest in connection with Prof. E. P. Lewis's letter in Nature of June 10.

During some recent experiments which I carried out in the Cavendish Laboratory, it was observed that the radiation coming from the gas in the path of the discharge between a Wehnelt kathode and an iron anode was rich in ultra-violet light. The strength of the discharge current was between one and two amperes. With air in the bulb and the pressure reduced as low as possible with a Geryk pump, the spectrum, which was photographed with a small Hilger quartz spectrograph, showed the nitrogen bands and the mercury line $\lambda\,2536$. As the pressure was increased by admitting a small quantity of hydrogen a continuous spectrum made its appearance, the mercury line increasing in intensity relatively to the bands. By washing out the bulb several times with hydrogen and removing the air by means of charcoal and liquid air, a continuous spectrum was obtained which showed no signs of the bands and lines. The spectrum extended beyond $\lambda\,2000$ and gradually faded away, due to the absorption in the spectrograph. The pressure of the hydrogen in the bulb was about 2 mm.

It is thought that this continuous spectrum is the result of the bombardment of the hydrogen molecules by slow-moving electrons, the energy of which is not sufficient to produce ionisation in hydrogen. Further experiments are necessary to test this idea, and I hope to be able to carry them out on my return to America.

James Barnes.

The University, Manchester, June 19.

The Names of Physical Units.

To all who are interested in the improvement of scientific nomenclature the points raised by Dr. Guillaume's letter (Nature, June 17, p. 427) are of great importance. In my opinion the case for rational nomenclature has been stated with both logic and humour by Dr. Guillaume, while Dr. Harker's reply seems to show misapprehension of the main point. All good nomenclature should be unambiguous, and, if possible, self-explanatory. The terms *masse volumique, volume massique,* and *stéradian* have both these desirable qualities; no one with a knowledge of physics and French could make any mistake as to the exact meaning of the first two, and the meaning of the third should be at once self-evident to anyone who knows the definition of a solid angle. I should not expect a chemist or a botanist to have anything but a hazy idea of the meaning of *puissance massique,* but even to an ordinary French engineer it should convey its meaning instantly.

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An expression of this kind, far from being an "eccentricity," is a triumph of nomenclature. It *is* possible to mould language by logic; it is the only way to mould language that shall be truly scientific. It is this method which has given such power of expression to the French language, not only in its magnificent modern prose, but more especially in its incomparable clearness when used for the exposition of science. Though our own language is somewhat less pliant, we cannot do better than imitate our more logical and enterprising neighbours in replacing confusing or ambiguous language by clear and rational terminology. Albert Campbell.

Teddington, June 19.

Training for Scientific Research.

I should like to say in regard to my letter on the above subject in Nature of June 17, that, owing to exceptional circumstances, I had not read Prof. W. H. Perkin's presidential address to the Chemical Society which appeared in the Journal of the society for April, in which he makes precisely similar suggestions. This was unknown to me at the time of writing, and naturally I am very glad to find myself in agreement with so influential an authority. I can only add my hope that he, furnished with all the qualifications for the task, will succeed in persuading the universities to a reform upon which so much depends, and for which the time is favourable. T. S. Patterson.

Organic Chemistry Department, University of Glasgow, June 20.

Extinguishing Fires.

In reference to Sir W. A. Tilden's article in Nature of June 10, may I direct attention to the fact that an ordinary syphon of "soda-water" is a very effective fire-extinguisher if used in the early stages of an outbreak due to bombs, etc., and it is a wise precaution to keep a supply, of the larger size, in readiness.

A small piece of rubber tubing may be slipped over the nozzle in order to direct the discharge, or the syphon may be inverted whilst held in the hands.

C. Carus-Wilson.

June 14.

THE SYNTHETIC PRODUCTION OF NITRIC ACID.

The recent pronouncement of the German Chancellor, and the statements which have appeared from time to time in the daily Press and in technical journals, respecting the enormous extension in the methods of transforming atmospheric nitrogen into ammonia and nitric acid, which are claimed to have been developed by German chemical engineers, have attracted such widespread attention at the present time on account of the necessary employment of this acid in the manufacture of explosives, that it may not be uninteresting to explain shortly, and in general terms, the main principles of the methods by which such transformation is effected. The actual details of the manufacturing processes now employed in Germany have not been published, and are not likely to be made known for some time to come. But there is little doubt that these processes are, in the main, merely extensions or refinements of methods already established, and in more or less successful operation, at Odda, Notodden, and Christiansand in Norway, at Legnano, near Milan, at La Roche-de-Dame, in the south of France, and at Niagara Falls. Even before the outbreak of the war, factories for the utilisation of atmospheric nitrogen in the manufacture of synthetic ammonia and nitric acid were at work in Westphalia, at Knapsack, near Cologne, at Spandau, and in one or two places in Austria-Hungary. Similar works have been erected, or are in course of erection, in the United States, Switzerland, and Japan.

Although a considerable amount of British capital has been invested in Norwegian enterprises, no attempts have hitherto been made in Great Britain to utilise the vast stores of potentially combined nitrogen which exist in the air. It has been calculated that the air over a dozen acres contains as much potential nitric acid as is annually exported in the form of Chile saltpetre. The apparent apathy of the British manufacturer is probably due to the circumstance that hitherto we have not suffered to any appreciable extent from any shortage of nitrates or nitric acid, and that, so long as we have command of the sea, we are not likely to suffer for some time to come. But it must not be forgotten that the supply of Chile saltpetre is not inexhaustible. The rich deposits of Tarapaca are already worked out, and what is now obtained from the more inaccessible districts of Antofagasta, Toco, and Taltal is of much lower quality. On the other hand, we gather from the Chancellor's statement in the Reichstag that the new industry in Germany is to be protected for at least a number of years, which would seem to imply that the manufacture cannot be worked on ordinary commercial lines. The probable effect of protection would be to limit, if not altogether to destroy, the importation of Chile saltpetre into Germany, and thereby to diminish its price to us unless German syndicates manage to obtain control of the workings.

Another reason for the apparent lack of enterprise on the part of the British chemical manufacturer is the assumption that hitherto the commercially successful working of all such synthetic processes would seem to depend upon cheap water-power, of which this country has no very ample store. But it may be doubted whether this disadvantage is altogether insuperable, at least under certain conditions. At all events, it is certain that the German engineers have to look to other sources of energy. What will be the ultimate effect on the price of nitric acid remains to be seen. In the meantime, it is probable that its present cost to Germany is far higher than to us.

The new methods of making nitric acid from atmospheric nitrogen are twofold in character; either direct, that is, by the direct combination of nitrogen and oxygen, or indirectly through the intermediate production and subsequent combustion of ammonia. The direct formation of ammonia by the union of its elements, nitrogen and hydrogen, has frequently been attempted, but hitherto with very limited success. It has long

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